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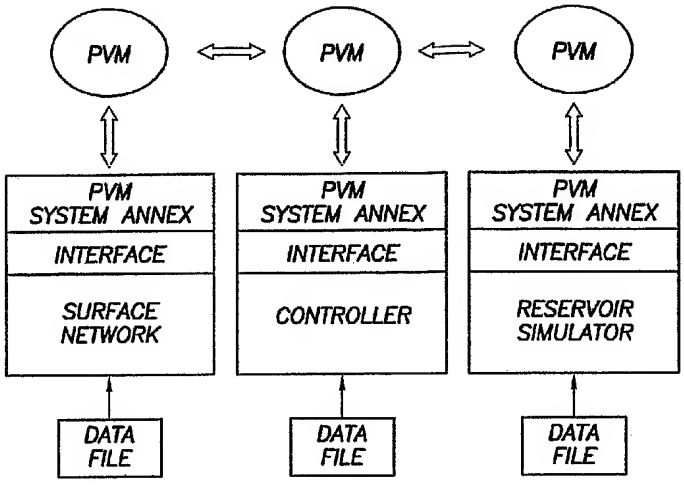
(54) Title: METHOD AND SYSTEM FOR INTEGRATED RESERVOIR AND SURFACE FACILITY NETWORKS SIMULATIONS



–ARCHITECTURE OF THE COUPLED RESERVOIR/ NETWORK SYSTEM.

(57) Abstract: Integrated surface-subsurface modeling has been shown to have a critical impact on field development and optimization. Integrated models are often necessary to analyze properly the pressure interaction between a reservoir and a constrained surface facility network, or to predict the behavior of several fields, which may have different fluid compositions, sharing a common surface facility. The latter is gaining a tremendous significance in recent deepwater field development. These applications require an integrated solution with the following capabilities: * to balance a surface network model with a reservoir simulation model in a robust and efficient manner. * To couple multiple reservoir models, production and injection networks, synchronising their advancement through time. * To allow the reservoir and surface network models to use their own independent fluid descriptions (black oil or compositional descriptions with differing sets of pseudo-components). * To apply global production and injection constraints to the coupled system (including the transfer of re-injection fluids between reservoirs). In this paper we describe a general-purpose multi-platform reservoir and network coupling controller having all the above features. The controller communicates with a selection of reservoir simulators and surface network simulators via an open message-passing interface. It manages the balancing of the reservoirs and surface networks, and synchronizes their advancement through time. The controller also applies the global production and injection constraints, and converts the hydrocarbon fluid streams between the different sets of pseudo-components used in the simulation models. The controller's coupling and synchronization algorithms are described, and example applications are provided. The flexibility of the controller's open interface makes it possible to plug in further modules (to perform optimization, for example) and additional simulators.

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